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# **Research on the feasibility of sustainable transport in the Municipality of Spetses. The transformation into a car-free island.**

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## **Abstract**

The framework that cities are being planned nowadays, differs significantly compared to the models of the 20th century. Issues of sustainable mobility are raised and the tendency to robust cohesive urban environments is unquestioned. Environmental capacity is shrinking while private cars tend to *load* public spaces. Consequently, the control of car accessibility on traffic design is in a critical stage. Especially Greece is well behind other developed European countries as it is bounded with car mobility and the successful examples of car restriction are limited.

Spetses island is a Greek settlement that is predominantly car-free. The originality of this study is the fact that it is asked to respond to a number of issues with the first to be the 'extended presence of motorbikes and ATV's (quads)'.

In this paper we present a traffic study as implemented in Spetses focusing on the following factors;

- Residents' VS Visitors' Mobility, Youth and Elderly
- Settlements' accessibility VS the Old Town's
- Bicycles VS Motorbikes. Could the electric bicycle provide a solution?
- Delivery Vehicles
- Inner settlement Parking VS Settlement penetration and outer parking areas
- Land VS Waterborne Public Transport
- Narrow and Labyrinthine streets VS spacious coastal routes

**Keywords:** car-free settlements, traffic design, motorbikes

**Main Conference Topic:** Transport, Logistics or Information Technology

## **Introduction**

The issues of urban planning, that dominate the modern research are centered around two subject areas; the control of urban sprawl and the managing of cities' saturation by automobiles. The length of travels is increasing as cities are expanding. Car-dependency is growing as public transport is not able to serve the emerging demand of travels. Hence, cities should be transformed into more sustainable entities. The redevelopment of car accessibility on street networks has become one of the crucial principles on planning. Planning policies now tend to focus on more collective, health, safe and communicative urban spaces where pedestrians and cyclists are the centre of urban living. Many remarkable applications are found around Europe as well as in the US, from the common ones like extended pedestrianizations, traffic calmed neighborhoods, public transportation regenerations to more revolutionary ones like car pooling, car/ bike sharing, car free housing et cetera. Greece, although moves slowly towards sustainable means in its major cities, seem to invest easier in tourist areas, where visitors seek to interact with urban space and not simply bypass streetscapes. Intense road traffic, extended on-street parking, environmental pollution is considered apparently unattractive in such places. The first priority for the visitor is

not the movement from a place to another, but rather the *stop* to public spaces and landmarks in order to learn its history and realize its details. Residents in such places usually appreciate the qualities that make the space attractive and try to overcome any difficulties car restrictions can create.

*Carfree cities* are population urban centers that rely primarily on walking, cycling and public transport with some sort of control/ restrictions for cars. According to J. H. Crawford, in order for a city and/ or an area to be included in the long catalog of carfree cities, it should meet the following two basic standards and a number of design criteria;

- It should have its own district character and style of architecture, with a unique pattern of streets, squares and buildings
- It should have a relatively large size like a part of the city, a town or an island with at least 750 meter diameter

Those districts, according to their size and car accessibility, can be divided into three main categories; the ones that are predominantly car-free, others that have various restrictions allowing though parking and motorcycle movement and lastly those that protect significantly their urban centers allowing though higher car presence.

Spetses as a primarily car-free island encounters difficulties concerning the extensive presence of motorcycles and wider inadequate planning. Typically Spetses belongs to the second category.

### **Background**

The question of the presence or removal of the car is not solely a technical issue as it is usually seen. The transformation of an area into a car-free zone is more a decision about the priorities to be set, the value of urban space as well as the visions of the city of tomorrow. After setting the vision to a car-free city, technical issues are going to be tackled to make the place functional. Different approaches and techniques are applied according to the design and capacity of the street network, the urban form and the land uses.

Historical centers and medieval towns are naturally designed regardless of the cars, so the shift to car-free districts appears more manageable. In this way they manage to preserve their identity and promote their present qualities in order be sustained culturally, socially and economically. Greek experience has to show various similar examples in historical centers (i.e. Rhodes Old City), the range of the car-free zones though is usually limited. In the last 10 years, 'encouraging' car restriction policies are beginning to apply in many provincial cities (e.g. Rethymno, Karditsa, Volos, Kalamata etc.) while in Athens the pedestrianization scheme of the main street (Panepistimiou str.) connecting two of the most important public squares (Syntagma and Omonoia) is expected to enhance deprived central districts and highlight the historic Commercial Triangle of Athens. Hydra island as well as Spetses are protected traditional settlements, predominantly car-free.

The street network of Spetses' settlement has narrow and labyrinthine streets (fig.1,2) varying from 3 to 7 meters wide. Speed limit is generally set to 20 km/h, while there are exceptions to 10 km/h for even narrower streets. Its terrain is very complex with mountains reaching 291meters high. The historic center has dense urban fabric with 150.07 residents per km<sup>2</sup> (compared to neighboring islands, Hydra with 30.72 residents/km<sup>2</sup> and Poros with 80.88 residents/km<sup>2</sup>).

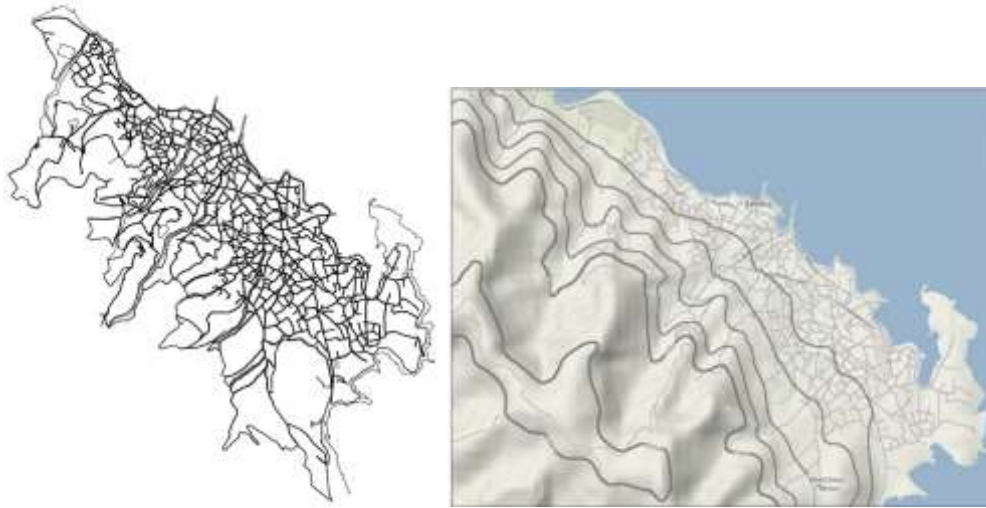


Figure 1,2: Spetses' urban fabric and topography illustrated with contours

The geometry of the road network appears irregular, the street widths vary widely, there are only a few alignments and the dead-ends are too many. There are only a few streets long enough to run through the village and thus continuous turns lead to de facto low speeds. The coastal route allows the interaction between the east and west side, although when it reaches the city center is forced into a zigzag route.



Figure 3,4: Existing street widths where red illustrates streets narrower than 3 meters and Existing Dead-ends

While examining the potential of the street redevelopment we realize that any intense interventions will alter the identity of the island, a perspective which is conflicting to the principles of protection that are set for the area. Even small alterations in order to facilitate car movement are made carefully to ensure safety while at the same time discourage traffic. The construction of a new ring-road outside the historic city, as implied from previous plans, to accommodate public transportation between the settlements and carriage of goods is a very expensive project regarding its utility.

Common issues, as raised in similar ventures, are centered around public transportation systems, placement or not of parking spaces, the managing of deliveries as well as issues of mobility for disabled and vulnerable groups of people. The unique challenge here -the strong role

of motorcycles- complicates the context of the study as they can use the same routes with bicycles and most of the times with pedestrians, can park everywhere, overcome the difficulties created by the terrain et cetera, though they are not portable. Mediterranean climate allows them to use it throughout the year, replacing completely car mobility.

### **Methods**

The research method followed preserves standard analytical tools, exploring each of the parameters that add on the upcoming issues, while joins contemporary findings regarding sustainable mobility. The basic principles of car-free zones are developed with respect to the particularities of the place.

The municipality of Spetses includes Spetses city and 11 more settlements with various homogenous characteristics, though increased urbanization in the Old City requires case specific handling. Considering the current situation as well as the evolution of the areas, we evaluate the findings highlighting crucial aspects of existing planning. We analyze technical issues regarding street hierarchy, classify road widths with sections, monitor alignments and visibility. The coming sections of the study report thoroughly the aspects of parking and motorbike mobility while later introduce proposals for core routes around the island, exploring the potential of waterborne public transport, horse-drawn vehicles and electric bicycles.

### **Mobility, Parking and Motorcycles**

As stated earlier, although the street network presents various inconsistencies, the possibilities for a dynamic intervention are restrained by the main vision of the area. The current situation presents spotted vehicles crossing the settlement as well as parking in open spaces and squares, which is far from the proposed vision by the planning authorities. The above is considered as a violation of the quality of settlements and prevents roads from becoming vital places for recreation. Such parking (fig.5,6,7) has little to do with typical on-street parking as seen in regular grid-based cities, as it alters the peculiarities of urban fabric.



Figure 5,6,7: On street parking in Spetses city and in green open spaces altering the character of the place

The legislative framework dictates that all three-wheeled and four-wheeled motor vehicles are banned from the city, regardless of the fuel they consume. Permanent residents and workers can use the 'municipal card' in order to bring their car in the island, though only for parking. Retailers for vehicle rentals can typically have maximum five ATVs for rent although it is violated. Specific policies exist for the entrance and exit of vehicles according to the entry harbour, the time of the day and season. All residents should have their own parking lot and if not they should park in the municipal parking, which capacity is not adequate. Parking is also institutionally banned from main public squares, pedestrian streets and around key landmarks only for specific seasons, which is conflicting with the wider strategy of the car-free city.

The set of proposals tries to promote alternative measures to free the city from extended parking. The interventions focus on the creation of outer-city parking spaces, though in a walking distance to the city centre and on the reduction of the number of allowed incoming vehicles. Moreover, place-specific add-on street furniture are expected to prevent from parking which if



combined with a charging policy will lead on the needed outcomes. The above measures could only be meaningful if they are properly monitored and evaluated in a regular basis.

The phenomenal presence of motorcycles in Spetses was the surprising answer to car ban as the legislative framework was not referring straight to them, while also weather conditions and Greek tradition was in favor of it. Motorcycle is an cheap, easy, adaptable and unisex means of transport. Can park anywhere, starts and stops without delays and is also affordable both for buying and renting. The common argument in Greek urban areas against the motorcycle is the issue of safety because of cars...which apparently is not valid in this case. But, can motorcycles adapt smoothly on Spetses' urban environment?



Figure 8,9: High concentration of motorcycles degrades the aesthetic of the island

The response is negative for two basic reasons. The first relates to the pollution caused by such traffic while the second is immediately connected to the geometry of the street network. Pollution caused by motorcycles is originally noise disturbance and less air pollution, but in the case of Spetses the topography acts against proper ventilation which, if combined with its narrow streets, degrades further the climate of the settlement. At the same time curved, labyrinthine streets without sidewalks create uncertainty for pedestrians as many intersections have limited visibility, resulting in numerous accidents caused by motorcycles. We analyzed a randomized sample of 11 intersections (fig.11), which showed that the speed of 20km/h in such a network is prohibitive in terms of pedestrian safety (fig.12).



Figure 10,11: Sample intersections for visibility check and an indicative example

This side-effect of car-restrictions is an issue that creates a Greek paradox and remains predominantly unsolved even in larger cities like Athens, where motorbikes bypass easily barriers for cars and continue their routes unbothered. The above creates the need for finding alternative solutions and appears as a challenging opportunity for the electric bicycle. Moreover, a network of one-way streets is going to relieve the busy main roads.

## **Place and Mode-Specific Strategies, Traffic Policies and Utilization of Technological Tools**

As the aim of this study is to provide complete proposals for short and long-term strategies towards the transition to a car-free island, we approach mobility issues in two complementary

directions. Traffic policies refer to characteristic routes in the traditional city center and connections between different settlements, while the technological advantage is utilized in favor of sustainable mobility. Mode-specific strategies specialize in the various means of public and private transport as well as in delivery vehicles (trucks, commercial vehicles).

#### The potential of the electric bicycle

The topography of the island presents severe inclines both for inner-city and outer-city long routes which makes the two common alternatives to the motorcycles (walking and cycling) prohibitive for further promotion. This is not to suggest the replacement of the above ways in favor of a third machine. Walking and cycling will also be encouraged if motorbikes are to be eliminated. The electric bicycle combines the advantages of a common bike and at the same time offers the ability of carrying goods and covering longer distances in any terrain. The cost of them is well above the conventional bicycle, this is why in various countries and cities of Europe, governments and municipalities subsidize their purchase by covering part of the cost. Regions like Spetses could consider the potential of such a move and weigh the benefits to invest in a project of buying and/ or renting some. A tested method around Europe is that the municipality becomes the example of development. It is suggested that the Municipality of Spetses could buy a number of electric bikes for its employees as well as for workers in other bodies. Another motive with multiple benefits is donating an electric bicycle to students with distinction at schools. In the above ways the venture acquires prestige and becomes attractive to social groups. Similar experience has shown that the promotion of a new technology, like the before-mentioned, is greatly enhanced if combined with broader interventions.

#### Waterborne Transport

Planning of the street networks in Spetses for the last 15 years reversed mobility from the traditional marine to car-dependent. As a result most of the visitors prefer to access the island by car and park it in Kosta harbor, which is in the opposite coast. This led to the degradation of Kosta into a large parking lot and eliminated the scheduled ferry routes from Piraeus. As for the travels between the urban settlements, they are conducted typically by water- taxis, which price though is not affordable. As an alternative people use small boats in order to be transferred in their destination. These boats have mainly the character of a bus as their schedule tend to be random and they are over-crowded. Our proposal focuses more on the re-design of existing docks both for taxis and boats and on the urge for an improved schedule and timetable.

#### Getting around the main settlements and the harbor

Travels between the city and the Dapia harbor, which are the most popular, are currently conducted by private cars, taxis and hotel vans. The alternative that is examined here takes into account that most of the travelers carry their luggages so they could not walk or cycle to their destination. Luggages though can be transferred together or separately from their owners. The basic proposal promotes firstly the redevelopment of the waiting area which could have an advanced locking station, together with the reorganization of transfers. Luggages could be transferred with vans, cars and/ or taxis -which will be gradually upgraded to electric vehicles- while visitors could borrow electric bicycles, move with their own bike or be distributed to their destinations with minivans.

For the residents, that own private cars and use them to travel around the island but park in the city center, a new approach is attempted. The already existing parking spaces have inexplicably high prices and low management, so drivers tend to leave their cars 'just outside' the designated areas causing severe jams to the coming buses and taxis serving the harbor. During high seasons the issue becomes even more problematic.

The two proposed parking areas will be placed in the perimeter of the city which will immediately serve travels without loading inner-city roads. An regenerated route will serve East-West connections by car.

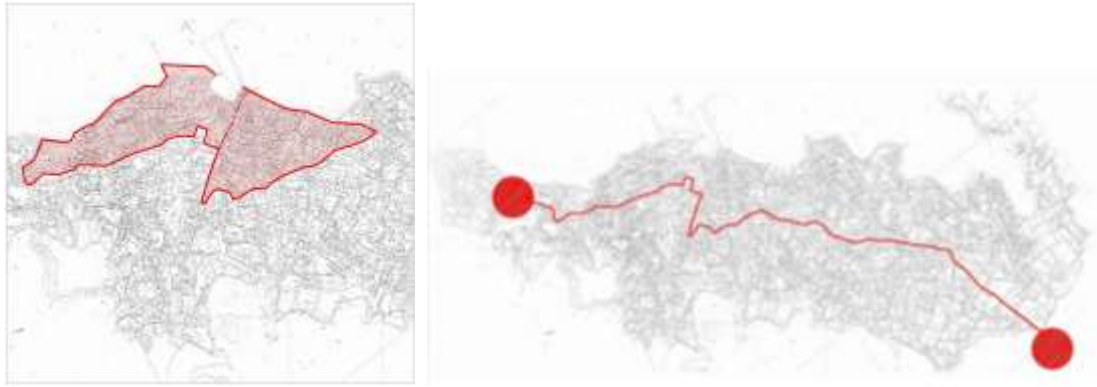


Figure 12,13: Proposed 'ring-road' and East-West route

For inner city travels the focus will be on walking, cycling and electric bicycles while taxis and mini vans will be allowed although in smaller numbers. Electric three-wheeled vehicles can also be used for delivery of goods. With the proposed street hierarchy and the various transformation to one-way streets the routes for motor-vehicles will be clearly defined and the reduce of noise and air pollution will be achieved. Especially for motorcycles there will be case-specific interventions (Fig.14,15) in order to prevent them from penetration in quiet areas. Bearing in mind that motorcycles move freely on the urban environment without restrictions we decided to act in a rather forceful way and cease them. The new 'dead-ends' or road cuttings are designed according to the width of each street, the peculiarities of the network and the needed accessibility of important land uses. This idea transformed ideally previous streets into 'yards', increasing safety, sense of place and creativity in public spaces.



Figure 14,15: Tackling motorcycle moves while letting pedestrian, cyclists and wheelchairs to access the relieved zones.

For the better application of the project there are important regulations that should be set and followed regarding private cars (timetable for entrance and exit for specific seasons, number of cars/ household, compulsory municipal card, parking in specified areas etc.), private and public delivery trucks (size, weight, timetable for deliveries etc.), vehicles carrying fuel and building materials (size, weight, season etc.). Motorcycles are excluded from some inner-city travels (i.e. Kounoupitsa- Varvaresos store). ATV's are prohibited all around the settlement. Taxis are allowed in the 'ring-road' and coastal route and should park only in designated areas. Buses and mini buses travel on 'ring-road', coastal route and regional connections and park in Bus Terminals. Horse-drawn carriages are allowed all around the city and can park both outside and inside the center in specified areas. Lastly, regarding water-taxis and fish-boats, all travels are allowed as long as their maximum capacity is for 8 people and park in the specified docks.

### **Conclusion**

Spetses island was not historically designed for motor-vehicles and has proven that can successfully survive and thrive without them. Car free developments ensure in the long term a



more sustainable environment which will cover the various needs of any society. They promote respect to the natural environment and prove that there are feasible alternatives to the car less time and money consuming. Moreover, it has been observed that various businesses and retail are favored by the prohibition of motor vehicles and pedestrian pathways, since the potential 'gathering places' are increasing so the number of people visiting those places is larger. The pedestrianization of streets though several times leads to the closure of specific businesses for a number of reasons regarding the land values, the type of business et cetera. Generally speaking, businesses benefit from such developments especially when they approach planning in a robust and thorough way and not regenerate an area while harming a neighboring.

In recent years, there are attempts-many of them successful- in various countries for the 'reshaping' of cities away or in a better balance to the private automobile, as environmental issues are raised constantly as well as issues regarding the sustainability of urban spaces. There is then a global movement towards the promotion of such places aiming at a different aspect of mobility where the public places will be more active, communicative and 'alive'. Tackling mobility though in an almost car-free place like Spetses island is not considered to be an easy issue but rather complex and challenging. Getting to intervene in an area that is seemingly an already ideal urban scene generates dilemmas and poses risks...The combination of the proposals aims at improving mobility in the main urban settlements, reorganizing doubted travel patterns and removing air, noise and aesthetic pollution.

A general remaining question that generates further discussion about the selection of places to be transformed into car free, and especially in Greece. We see mainly tourist areas or part of cities that generally invest on urban tourism to attempt such 'motions' and shifts while at the same time we keep on loading our urban centers with more traffic. Another worrying phenomenon relates to the modern large scale car-free residential developments (i.e. in Vienna, Hamburg and various in the US) that add somehow on urban sprawl.

Where is the uniqueness of Spetses transformation though that is worthy of our attention? The study on Spetses is mostly serving urban planning goals where traffic design was complementary. The main aim is the protection and enhancement of the settlement's identity, so as the resident, worker and visitor could enjoy the place without severe noise disturbance. An essential focus on the proposed traffic management is the creation of the technical 'dead-ends' for motorcycles, which if combined with the peculiarity of the network can decrease drastically the freedom of the user. Another core aim is the improvement of the accessibility of the area by walking for small distances and by cycling for longer ones. Lastly, the issue of parking is tackled with two large parking areas in the periphery of the city, which are connected to the city and to each other by public transport.

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Efthimios Bakogiannis is an Urban Planner and Transport Engineer, working as a research associate in National Technical University of Athens, School of Rural and Surveying Engineering, Department of Geography and Rural Planning. He is one of the founding members of the 'Sustainable Mobility Unit-SMU' in the N.T.U.A. <http://www.smu.gr/>. He is also a member of the department of Housing and Urban Issues, located in the School of Rural and Surveying

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Maria Siti is a Rural and Surveying Engineer with a master in Urban Design, working as a research associate in National Technical University of Athens, School of Rural and Surveying Engineering, Department of Geography and Rural Planning. She is also a member of the 'Sustainable Mobility Unit-SMU', N.T.U.A. As an undergraduate she has conducted researches related to urban regenerations and environmental planning while her dissertation focused on the effects caused by pedestrianisation of main shopping streets. As a postgraduate she has participated in masterplanning projects, development appraisals and landscape interventions. She was awarded by the Royal Town Planning Institute West of Scotland Chapter (RTPI) in 2012. Maria has also conducted a thorough research on 'live multi-disciplinary urban design projects' between university students, practitioners and community members.

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